FIRE BIBLIOGRAPHY

National Fire Coordination Study

U.S. DEPARTMENT OF AGRICULTURE/FOREST SERVICE/DIVISION OF FIRE CONTROL

FIRE BIBLIOGRAPHY

Selected Urban, and Mixed Urban - Rural Fires, 1940-1964

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INTRODUCTION

The charter for the National Fire Coordination Study calls for study of "selected fires involving Federal, state, and local firefighting resources". The findings from these study fires will be used to help make recommendations concerning a National Fire Defense Program. Specific objectives of the fire studies are:

A. Identify factors important in better utilizing the capabilities of Federal, state, local, and private fire organizations in effective control of mass fires.

B. Identify problems which relate to the effectiveness of fire suppression efforts.

C. Identify effective measures for protecting key areas which could be adapted to protecting shelters.

D. Identify measures that can be taken in advance to lessen the likelihood of initial ignitions, lessen the severity of the fire, and improve effectiveness of control efforts.

E. Relate effectiveness of strategy, tactics, and logistics commonly used in suppressing large fires to the problem of suppressing fires when nuclear fallout is involved.

Selected large fires that occur during the course of the National Fire Coordination Study will be studied on site. In 1964, three such fires were studied and reports prepared.[1/] In addition, selected past fires will be studied that relate to the objectives of Project 229.[2/] These past fires include both urban fires, and mixed urban-rural fires.

OBJECTIVES

This report provides an "annotated bibliography" of selected past fires that were considered for study by the staff of Project 229 and includes a brief summary and description of; (1) strictly urban fires and (2) fires in mixed urban-rural areas. Study fires were chosen from this prepared list. Eighty major fires occurring since 1940 are described. Of these 80 fires, 47 are urban fires and 33 are mixed urban-rural fires. The listing of fires in this manner provides a base from which to choose addition fires for possible study, and makes available the results of our search of past fires for people who in the future might review or study large fires.[3/]

1/ The Nevada Fires, NFCS, August 1964, by J. W. Jay
The Park Headquarters Fire, NFCS, September 1964, by J. H. Dieterich
The Santa Rosa Fires, NFCS, June 1965, T. G. Storey

2/ The Deadwood South Dakota Fire, NFCS, September 1964, by J. H. Dieterich and D. B. Gratz

3/ The National Fire Coordination Study will publish a more complete tabulation of historical large fires. It will provide less detail on each individual fire but will include fires dating back to 1835.

FIRE SELECTION CRITERIA

The fires included in this report were selected subjectively but certain criteria were established to help prepare the list from the hundreds of fires that have occurred in urban and mixed urban-rural areas since 1940. Criteria for selection were as follows:

a. Had occurred in the United States in 1940 or later.

b. Were strictly urban fires, or rural fires that involved a substantial number of structures.

c. Were fires that showed tendencies to spread - particularly in mixed urban-rural areas.

d. Involved mutual aid, preferably from several different agencies and organizations.

e. Presented suppression problems such as structure protection, long distance spotting, evacuation, over-extended forces, etc.

f. Formal reports, office reports, or other written information were available.

These fires are not necessarily the most severe in terms of total property damage, although all rank high on that score. Many fires more damaging than these were excluded because they involved only a single structure such as a warehouse with valuable contents, a large hotel, a refinery, or failed to meet other criteria.

Available reports, or sources of information for individual fires, are indicated. It is likely that additional information could be found on nearly all of these fires by reviewing local newspapers, contacting the fire departments involved and making specific surveys of available fire journals and publications.

SUMMARY OF URBAN FIRES

No.	Date of Origin	City	State	Structures	Remarks
1.	7/30/40	Camden	N. J.	38	5-Block Area
2.	2/8/42	Philadelphia	Pa.	20	
3.	4/13/42	Kewanee	Ill.	17	
4.	1/21/43	Colorado Springs	Colo.	25	
5.	9/7/43	Oakland	Calif.	10	
6.	12/25/43	Wildwood	N. J.	30+	
7.	10/20/44	Cleveland (Gas Plant)	Ohio	89	
8.	5/30/45	Mahanoy City	Pa.	34+	
9.	8/23/45	Alton Bay	N. H.	235	
10.	1/27/46	Charleston	W. Va.	19	
11.	2/2/46	Syracuse	Ind.	12	
12.	6/25/46	Medford	Ore.	-	3-Block Area
13.	7/11/46	Clinton	Mo.	13	
14.	4/16/47	Texas City (Explosion)	Tex.	-	Industrial Area
15.	4/14/48	Laramie	Wyo.	9	
16.	12/25/49	Hyndman	Pa.	37+	
17.	4/2/50	Wilmington	Del.	35	
18.	11/6/50	Stamford	Conn.	8	
19.	1/4/51	Evansville	Ind.	17	
20.	1/7/52	Atlantic City	N. J.	18	
21.	1/27/52	Mattoon	Ill.	18	
22.	3/21/52	Wrangell	Alaska	21	
23.	5/16/52	Burbank	Calif.	10	
24.	6/30/52	New York	N. Y.	22	
25.	7/9/52	Burbank	Calif.	-	15 Ac. of Bldgs.
26.	12/12/52	Rockland	Me.	14	
27.	8/12/43	Livonia (Gen'l Motors Plant)	Mich.	-	Bldgs. Covering 34 1/2 Acres
28.	2/6/54	Zion	Ill.	16	
29.	7/16/54	Chestertown	Md.	30	
30.	8/4/54	Pekin (Whiskey Whse.)	Ill.	4	Large Buildings
31.	8/27/55	Whiting (Refinery)	Ind.	2+	Large Buildings
32.	9/25/56	Portland	Ore.	30	

No.	Date of Origin		State	Structure	Remarks
33.	8/6/59	Albany	Ore.	9+	Large Buildings
34.	8/7/59	Roseburg (Explosion)	Ore.	45	
35.	4/15/60	Newark	N. J.	23	
36.	6/5/61	Ayer	Mass.	8	
* 37.	5/10/62	Boston	Mass.	3	Large Buildings
38.	8/20/62	St. Louis	Mo.	13	Large Buildings
39.	3/20/63	Terre Haute	Ind.	4	Large Buildings
40.	4/4/63	Quinton	N. J.	28	
41.	4/20/63	Bayonne	N. J.	26	
42.	5/2/63	Cordova	Alaska	15+	
* 43.	10/12/63	Boston	Mass.	7	Large Buildings
44.	11/18/63	Atlantic City	N. J.	7	Large Buildings
45.	3/27/64	Valdez (Earthquake Fire)	Alaska	-	"Whole City"
* 46.	5/22/64	Boston	Mass.	17	Large Buildings
47.	6/19/64	Lebanon	N. H.	20	

* Indicates Fires Studied

DESCRIPTION OF URBAN FIRES

1. July 30, 1940. Camden, N. J.

Explosion and fire destroyed group of manufacturing buildings, 32 dwellings, and 60 automobiles in a 5-block area. Ten persons killed and $2,000,000 property damage. Fire spread confined to surface fuels (no long-distance spotting). Fire duration 4 1/2 hours (1:05 p.m. to 5:30 p.m.). Mutual aid response from several adjoining cities. Lack of zoning and high winds favored fire spread. Wind speed 15-21 m.p.h. with gusts of "hurricane force", maximum temperature 94° F, minimum relative humidity 57 percent. Published reports by N.B.F.U. and Camden Fire Insurance Association available.

2. February 8, 1942. Philadelphia, Pa.

Fire destroyed 20 dwellings and business structures in a 2 1/2 block area in the downtown section. No lives lost. Property damage $1,000,000. Duration 2 1/2 hours (8:00 to 10:30 p.m.). Fire spread partly by flying brands, some setting fires 2 1/2 blocks distant from main fire. Spread favored by inadequate private protection, high wind, and freezing temperatures. Mostly wood-joisted brick construction with tar roofs. Wind NNW at 10 m.p.h., temperature 12° F, clear skies, humidity 80 percent. No record of mutual aid response although it probably can be assumed. No record of detailed reports of the fire.

3. April 13, 1942. Kewanee, Ill.

Fire destroyed 17 business buildings and damaged 10 others in downtown area. No fatalities. $1,650,000 property damage. Described in reports as a "conflagration", presumably spread by flying brands. Fire started at 1:37 a.m. but was beyond control when firemen arrived. No record of duration. Mutual aid response from 8 outside departments. Lack of exposure protection, high wind, and inadequate public protection favored spread. No other weather data available. No record of detailed reports of fire.

4. January 21, 1943. Colorado Springs, Colo.

Fire destroyed 25 buildings in downtown area. No record of lives lost, property damage, type of spread, duration or mutual aid involved. Mutual aid can be assumed in a fire of this size. High winds prevailed during fire. No record of detailed reports of fire.

5. September 7, 1943. Oakland, Calif.

Fire destroyed 10 buildings in city area. No record of lives lost, property damage, type of spread, duration, or mutual aid involved. Mutual aid probably can be assumed. No record of detailed reports of fire.

6. December 25, 1943. Wildwood, N. J.

Fire destroyed 28 mercantile buildings, 2 hotels and several dwellings in the waterfront area. Two persons killed and $1,000,000 property damage. Spreading fire from single building favored by high winds. Started in early morning. No record of duration or if mtutal aid involved. Strong wind, lack of exposure protection, sprinklers shut off, and access difficult to waterfront areas favored fire spread. No record of detailed reports of fire.

7. October 20, 1944. Cleveland (Gas Plant), Ohio

Explosion and fire destroyed 79 dwellings, 2 factories, and 8 mercantile buildings in city's industrial area. Killed 128, property damage $6,000,000. Intense heat from explosion of 2 containers of liquefied natural gas helped to spread fire. Duration 10 hours (2:40 p.m. to 12:40 a.m. Oct. 21). Mutual aid response from 7 outside departments, civil defense, and the Military. Maximum temperature 52°F, and minimum relative humidity 58 percent. Wind NE at 10-16 m.p.h. Published reports by N.F.P.A. and N.B.F.U. available.

8. May 30, 1945. Mahanoy City, Pa.

Fire destroyed 30 business buildings, 4 apartment buildings and garages in business area. No lives lost. Property damage

$1,000,000. Congested buildings of wood frame construction. Started at 3:10 a.m. No record of duration or whether mutual aid was involved. High winds (to 50 m.p.h.) and lack of exposure protection favored fire spread. No mention of spread by flying brands or weather conditions other than wind. Incendiary cause. No record of detailed reports of fire.

9. August 23, 1945. Alton Bay, N. H.

Fire destroyed 235 wooden cottages in this summer resort. Picture indicates homes were scattered among steep hills covered with dense natural brush and timber. Described as a "conflagration". No lives lost. Property damage $200,000. No record of time of origin, duration or whether mutual aid was involved. Spread favored by inadequate water distribution system, lack of exposure protection, inadequate public protection, congestion, delayed alarm, and wood shingle roofs. No specific mention of flying brands. No weather information or record of detailed reports of the fire.

10. January 27, 1946. Charleston, W. Va.

Fire destroyed 19 buildings of brick and concrete construction in the downtown area. No lives lost. No record of property damage. Fire started at 3:29 a.m. No record of duration or whether mutual aid was involved. No weather data or spread data. No record of detailed reports of fire.

11. February 2, 1946. Syracuse, Ind.

Fire destroyed 12 buildings in downtown area. No record of lives lost, property damage, type of spread, or duration. Started at 4:40 a.m. in "stiff" wind which favored spread. No other weather data. No record of whether or not mutual aid was involved. No record of detailed reports of fire.

12. June 25, 1946. Medford, Ore.

Fire destroyed packing plant, lumber mill, and 3 city blocks composed mostly of wood-frame business buildings. No record of lives lost. Property damage $1,000,000. Duration 6 hours (6:00 p.m. to midnight). No record of mutual aid response although it probably can be assumed for such a large fire. Fire spread favored by lack of exposure protection and delayed alarm. Flying brands from wood shingle roofs set fires 1 mile downwind. Wind speed reported as NW at 4-16 m.p.h., maximum temperature 71° F, minimum relative humidity 36 percent. A detailed report may be available from the Oregon Insurance Rating Bureau.

13. July 11, 1946. Clinton, Mo.

Fire destroyed 13 buildings in the business district. No record of fatalities, property damage, duration, weather, or mutual aid response. Fire started at 7:15 p.m. No record of detailed reports of the fire.

14. April 16, 1947. Texas City (Explosion), Texas

Explosions and fire destroyed waterfront industrial area including chemical plant, oil tank farms, warehouses, and 3 cargo ships. Residential and retail areas heavily damaged. Killed 468 persons. Property damage $67,000,000. Duration about 24 hours. Fires discovered in one ship about 8:00 a.m. which exploded at 9:12 a.m. Another ship exploded about 16 hours later at 1:10 a.m. April 17. Fires controlled about 8:00 a.m. Explosions set fires in oil tank farms but almost all damage was from blast and non-burning flying projectiles. Apparently few fires were set in residential and mercantile areas. Fire spread favored by delayed alarm, lack of exposure protection, inadequate public protection, ineffective fire-fighting, and breakage of water mains from blast. Mutual aid response for fire and rescue from many outside departments. Wind NNW at 20 m.p.h., temperature 56° F, cool for the time of year. Published reports by Fire Prevention and Engineering Bureau of of Texas (best), N.B.F.U., U. S. Coast Guard, and Oil Insurance Underwriters available.

15. April 14, 1948. Laramie, Wyo.

Fire destroyed 9 large business buildings in downtown section. No record of lives lost. Property loss $1,300,000. Fire duration 4 hours (1:45-6:00 a.m.). No record of mutual aid response but

probably was some because Laramie's fire department was termed "small". Flying brands set roof fires up to 1/3 mile downwind. Fire spread favored by inadequate public protection, delay in discovery, delay in alarm and high winds. Wind SW at 20-25 m.p.h., temperature 34°F, humidity "low". Brief report and map by fire chief available.

16. December 25, 1949. Hyndman, Pa.

Fire destroyed 25 dwellings and 12 business buildings, including the bank, involving 3 1/2 blocks. Killed 2 persons. Property damage $500,000. Duration 4 hours (5:30 - 9:30 p.m.). No record of mutual aid response although there probably was some involved. Described as a "conflagration". Spread favored by inadequate separation of combustible (mostly wood-frame) construction. Some fire spread by flying brands. Wind NE at 16-20 m.p.h., temperature 40°F, humidity 65 percent. Brief report by fire chief available.

17. April 2, 1950. Wilmington, Del.

Fire destroyed 35 buildings in the city. No record of lives lost, property damage, whether or not mutual aid was involved, or anything else about the fire. No record of detailed reports of the fire.

18, November 6, 1950. Stamford, Conn.

Fire destroyed 8 buildings in the city area. Driven by "strong" winds. No record of lives lost, property damage, whether or not mutual aid was involved. No record of detailed reports of the fire.

19. January 4, 1951. Evansville, Ind.

Fire destroyed 17 large buildings of brick and concrete construction in the downtown area. No record of lives lost or property damage. Started at 12:15 a.m. No record of duration, weather, or whether or not mutual aid was involved. No record of detailed reports of the fire.

20. January 7, 1952. Atlantic City, N. J.

Fire destroyed 18 buildings of various types of construction in city area. Driven by strong winds. No record of fatalities, property damage, duration, or whether mutual aid was involved. No other weather data. No record of detailed reports of the fire.

21. January 27, 1952. Mattoon, Ill.

Fire destroyed 18 buildings of various types of construction in the city. No record of fatalities, property damage, duration, or whether or not mutual aid was involved. No data on weather or type of spread. No detailed reports of the fire.

22. March 21, 1952. Wrangell, Alaska

Fire destroyed 21 buildings, primarily of wood frame construction. Driven by "strong" wind. No other data on hand. No record of detailed reports of the fire.

23. May 16, 1952. Burbank, Calif.

Fire destroyed 10 buildings of wood construction in downtown area. Fire spread "exceptionally rapid". No other data on hand. No record of detailed reports of the fire.

24. June 30, 1952. New York, N. Y.

Fire destroyed 22 buildings in the city. Driven by high winds. Start during working hours. No other data on hand. No record of detailed reports of the fire.

25. July 9, 1952. Burbank, Calif.

Fire destroyed 15 acres of buildings primarily of wood frame construction. Weather "tinder dry". No other data on hand. No record of detailed reports of the fire.

26. December 12, 1952. Rockland, Me.

Fire destroyed 14 buildings in the city area. Started at 6:28 p.m., driven by 40 m.p.h. wind. No other data on hand. No record of detailed reports of the fire.

27. August 12, 1953. Livonia (General Motors Plant), Mich.

Fire destroyed huge (34 1/2 acre), modern transmission manufacturing plant in city area. Lives lost: 6. Property damage $55,000,000, largest industrial fire loss on record. Fire spread favored by lack of fire cut-offs, incomplete sprinkler protection, improper roof construction, inadequate private protection, and delayed alarm. Duration 20 hours (3:50 p.m. Aug. 12 to noon (approx.) Aug. 13). The fire finally burned itself out since hose streams couldn't reach center of huge plant area 4,200 plant workers evacuated. Mutual aid response from at least 3 large outside departments. Wind NW at 11 m.p.h. Records of temperature and humidity also available. Report of the fire by N.F.P.A. available.

28. February 6, 1954. Zion, Ill.

Fire destroyed 16 buildings including a department store (origin), a factory, and other large structures in city. No record of fatalities. Loss $692,000. High winds carried sparks across a 112 foot wide street to ignite other buildings. Spread favored by failure of municipal water supply, making it necessary to pump water from a lagoon (alternate source of water). 38 pumpers were in service on the fire which indicates mutual aid response. Duration 3 1/4 hours (7:45 - 11:00 p.m.). No record of detailed report of the fire.

29. July 16, 1954. Chestertown, Md.

Explosions and fire destroyed 30 buildings comprising fireworks plant in city. Blast damaged many other structures. Lives lost: 11. Property loss $327,500. Started during daylight hours, duration unknown. Repeated explosions delayed firefighting 30 minutes. No record of mutual aid response. Weather data probably available. No record of detailed report of fire.

30. August 4, 1954. Pekin (Whiskey Warehouse), Ill.

Fire and explosions of alcohol destroyed 3 large wood-joisted brick warehouses and 1 large bottling building and damaged 6 buildings. Lives lost: 6. Property loss $7,130,000. Lightning set fire to one warehouse which spread sucessively by radiation to other buildings. Duration 42 hours (2:30 a.m. Aug. 4 to 8:30 p.m. Aug. 5). By noon of Aug. 4, the fire appeared to be under control and mutual aid units were released. However, about 7:00 p.m. fire was discovered in the third warehouse and assistance was summoned again. At 10:30 p.m. an explosion demolished the building and killed 6 persons. Firefighting was discontinued until 10:00 a.m. Aug. 5. Heavy rain fell the first night helping to control the fire. No record of a detailed report of the fire.

31. August 27, 1955. Whiting (Refinery), Ind.

Explosion and fire destroyed many structures and storage tanks in the refinery, plus 2 adjacent houses. Eighty houses received major damage and 100 were damaged to a lesser extent, mostly from concussion and projectiles from the explosion. Deaths: 2. Property damage $50,000,000. Fire spread from tanks ruptured by blast and heat. Burning oil flowed across major highway and down railroad tracks. Duration 8 days (6:00 a.m. Aug. 27 to Sept. 4). Mutual aid response from many paid and unpaid outside departments. 1,900 persons evacuated and cared for by police, Salvation Army, National Guard, Red Cross, and other officials. Temperature 95° F. Published report of fire by N.F.P.A. available.

32. September 25, 1956. Portland, Ore.

Fire destroyed wharf and 29 buildings including a warehouse, 6 houses, and 22 business occupancies in riverfront area. No loss of life. Property loss $2,096,000. Fire spread from building of origin along wharf and then to the roofs of 6 exposed buildings on a nearby hill. Started about noon, no record of duration. During a period of extreme drought. Very high winds blowing. Spread also favored by sprinklers shut off, delay in sounding fire alarm, inadequate private protection, and congested combustible wood construction. No record of mutual aid response. Weather data obtainable. No record of detailed report of fire.

33. August 6, 1959. Albany, Ore.

Fire destroyed a plywood mill and 9 houses. No loss of life. Property loss $1,423,000. Sparks from the waste burner ignited the mill. Flying brands from the burning mill transported by 28 m.p.h. wind gusts to ignite houses, fields, and fences downwind. Molten globs of aluminum carried 100 to 150 feet by fire. Described as conflagration. Started 4:44 p.m., duration unknown. Spread also favored by flammable construction, improper water valve system, and shortage of water. Had to draft from mill pond (alternate source of water). Temperature 90° F, humidity 25 percent. Mutual aid response from several outside departments. No record of detailed report of the fire.

34. August 7, 1959. Roseburg (Explosion), Ore.

Explosion and fire completely destroyed most of the buildings in a 12-block area in the downtown section of the city. Hundreds of other buildings extensively damaged in a 50-block area. The ensuing conflagration was confined to about 45 buildings in a 7-block area. 13 persons killed and 125 injured. Property damage $10,000,000. Fire originating in a warehouse detonated 6 1/2 tons of explosives in a truck parked nearby. Radiant heat and flaming debris scattered by the explosion set numerous fires. Fires were confined to a 7-block area through the combined efforts

of the local fire department and fire companies from several neighboring districts and nearby cities. Duration 2 hours (1:00 to 3:00 a.m.). Other mutual aid from State Police, Sheriff's office, National Guard, Red Cross, Civil Defense, and Salvation Army. Moderate (7 m.p.h.) N wind favored fire control. Temperature 70° F and humidity 31 percent. Published report by N.B.F.U. available.

35. April 15, 1960. Newark, N. J.

Fire destroyed 23 buildings (mostly 3-story) and a vacant fuel trestle in industrial area. Described as a conflagration. No fatalities. Suppression cost $250,000. Fire driven by 35 m.p.h. wind spread across 3 streets and blocks. Duration 3 hours. From data on amount of hose and ladder used can infer mutual aid was involved. Spread favored by high winds, flammable construction, and unprotected exposures. Other weather data available. No record of detailed reports of the fire.

36. June 5, 1961. Ayer, Mass.

Fire destroyed a large tannery, a rope factory, and 6 dwellings in the city. No loss of life. Property loss $4,410,000. High winds (gusts to 28 m.p.h.) spread fire through the tannery and

across street to rope works and dwellings. Spread also favored by high temperature, low humidity, inadequate water supply, and combustible building and contents. Duration 2 hours (6:10 - 8:00 p.m.), mopup took 24 hours. Mutual aid response from many outside departments and organizations. Temperature 86° F, humidity 34 percent, and wind SW at 16 m.p.h. with gusts to 28. Flying brands set small fires far downwind. Published fire report by N.F.P.A. is available.

37. May 10, 1962. Boston, Mass.

A fire starting in potato storage sheds along a railroad siding spread to adjacent homes and threatened the entire south end of the Charlestown community in Boston, causing damage estimated at 1.5 million dollars. The fire spread through storage sheds under the influence of a strong NW wind and required, in addition to the Boston Fire Department, the efforts of mutual aid forces, Military, and Civil Defense to prevent a major disaster. Report available from Boston Fire Department.

38. August 20, 1962. St. Louis, Mo.

Fire destroyed an 8-story business building under demoliton and damaged 12 other buildings. Injuries: 22. Property loss $550,000. Fire set by a cutting torch quickly involved the building of origin and spread flying brands downwind to involve 12 other buildings

up to 1/4 mile distant. A total of 21 pieces of fire apparatus responded to these exposure fires. Other small brand-set fires in the downtown business district were extinguished by tenants. Duration 3 hours (10:00 a.m. to 1:00 p.m.). Spread favored by shut off sprinklers, lack of exposure protection, wind, and delayed alarm. Wind SW at 8-10 m.p.h. and temperature 87° F. Mutual aid response from several companies. Brief published report by N.F.P.A. available.

39. March 20, 1963. Terre Haute, Ind.

Fire destroyed 2 four-story buildings and 2 five-story buildings of brick construction in downtown section. Spread from building to building by 20 to 30 m.p.h. wind. Described as a "conflagration". No loss of life. Property loss $2,500,000. Duration 7 hours (1:00 - 8:00 a.m.). Flying brands also set fires up to 1 1/2 blocks distant requiring apparatus be diverted from main fire. Mutual aid response from 14 cities up to 70 miles distant. Additional weather data available. No record of detailed report of the fire.

40. April 4, 1963. Quinton, N. J.

Fire destroyed 28 structures including 6 lumber yard buildings, 5 mercantile buildings, 10 dwellings, and 7 garages, all of wooden construction. No record of loss of life. Property loss $350,000. Duration unknown. Occurred during the day. A conflagration driven by 40 m.p.h. wind. Weather very dry (about the same time as the New Jersey forest fires). No record of mutual aid. No record of detailed reports of the fire.

41. April 20, 1963. Bayonne, N. J.

Fire destroyed 23 factory buildings and 3 dwellings and damaged 12 other structures in an industrial area. No mention of fatalities. Total loss $8,075,000. Duration 6 1/2 hours (2:00 - 8:30 p.m.). Fire driven by SW winds averaging 32 m.p.h. with gusts to 45 m.p.h. Buildings of various construction types from wood-frame to noncombustible and fire-resistive. Many exposure fires from flying embers both within and outside the plant area. One dwelling 2 blocks from the fire was ignited by embers and heavily damaged. Mutual aid response from many outside departments including fireboats from New York City. The weather had been unusually dry for several weeks. Temperature was 77° F. This was the same day the New Jersey forest fires started. Brief published report by N.F.P.A. available.

42. May 2, 1963. Cordova, Alaska

Fire destroyed 15 wood business buildings one to three stories tall comprising about 75 percent of the business district. No mention of fatalities. Property loss $1,800,000. Termed a "conflagration". Duration 10 hours (3:50 a.m. - 2:00 p.m.). Spread favored by congested, flammable construction, lack of exposure protection, inadequate public protection, and delayed mutual aid response. Mutual aid response from Government F.A.A. companies arriving by land and Air Force companies airlifted from Elmendorf A.F.B. Buildings dynamited in attempt to halt fire with questionable effect. No record of weather conditions. Brief published report by N.F.P.A. available.

43. October 12, 1963. Boston, Mass.

Two simultaneous multiple-alarm fires severely tested the Greater Boston mutual aid system, one of the oldest in the country. The first and largest fire in the South End District destroyed 4 large brick and timber structures up to six stories tall. (Morgan Memorial Fire) The second fire in the Dorchester District (Codman Square Fire) destroyed 3 large tenements each three stories high. No record of fatalities or property loss although the latter doubtless was quite high. Duration of the South End

Fire was 5 hours (11:37 a.m. - 4:28 p.m.) and for the Dorchester Fire 4 hours (2:15 - 5:54 p.m.). Flaming brands from the building of origin of the South End Fire were carried several hundred feet by a brisk wind to ignite other buildings, railroad ties, and bridges downwind. The humidity had been low (29 percent minimum) all week, temperatures were moderate for the season, winds "brisk" (NW at 25 m.p.h.), and the woods were in fire-dangerous condition. Many pieces of apparatus were employed extinguishing spot fires downwind of the main fires. The Dorchester Fire depleted equipment on the South End Fire. In addition, the neighboring city of Malden requested mutual aid assistance from Boston in the period for a multiple alarm fire of their own. This further strained the mutual aid setup. Brief published report by N.F.P.A. available.

44. November 18, 1963. Atlantic City, N. J.

Fire destroyed 6 resort hotels, 1 dwelling, and damaged 2 other hotels. All were of wood or wood-joisted brick construction and ranged up to 5 stories high. One dwelling several blocks downwind was severely damaged by fires set by flying brands. Lives lost: 25. Property loss not given but probably ran to several million dollars. Fire starting in the Surfside Hotel where all of the fatalities occurred quickly spread through the congested complex of flammable structures. Duration 5 1/2 hours (4:21 - 10:00 a.m.). The SW wind from the ocean helped spread the fire

downwind into other structures in the complex and, by flying brands, as far as 5 blocks downwind. Spread also favored by delayed alarm, unprotected exposures, and congested construction. Mutual aid response from 14 surrounding communities. These companies filled in at vacated stations and fought the fires set by flying brands downwind. Considerable evacuation carried out. Brief published report by N. F. P. A. available.

45. March 27, 1964. Valdez Earthquake Fire, Alaska

Fire following a severe earthquake destroyed a bulk oil plant, storage tanks, and 4 wood-frame structures mostly 2 stories high in the waterfront area. No lives were lost as a direct result of the fire. Property damage was $125,700. Started in the afternoon. No record of duration. Origin in and around the oil plant from an electrical short circuit caused by the quake. Oil from ruptured tanks was spread on and by the water in the ensuing high waves. Weather was overcast with occasional light showers of rain and snow. Mutual aid response from Valdez Volunteer Fire Department, Police Department, CD unit, and U. S. Army from Fort Wainwright. Brief report from Valdez fire chief available.

46. May 22, 1964. Boston, Mass. (Bellflower Street Fire)

Fire destroyed 17 wood-frame dwellings ranging up to 3 stories high and damaged 22 others. Described as a "conflagration". No deaths or serious injuries. Property loss $750,000. Location: the Dorchester District of Boston. Houses were congested but well maintained. Duration 3 1/4 hours (1:30 - 4:45 p.m.). Wind SW at 27 m.p.h. with gusts of 39 m.p.h., temperature 76° F, humidity 37 percent, sky overcast and no rain for a month. Wind driven fire spread by radiation and flying brands. Radiation set fires 50 feet upwind across a street. Flying brands set incipient fires several blocks downwind but were controlled by patrolling ladder companies. Twenty-eight of the 67 ladder companies were from out of town. An additional 24 mutual aid companies helped cover Boston's districts. Considerable evacuation done. Published reports by Boston Fire Department and N.F.P.A. available.

47. June 19, 1964. Lebanon, N. H.

Fire destroyed 20 buildings and a wooden railroad overpass in the downtown section. Buildings mostly old wood-frame 1 to 3-story mercantile occupancies. Described as a "conflagration". Wind-driven fire spotted across streets, a railroad right-of-way,

and a river setting fires several blocks distant in both structures and fields. Lives lost: 2. Property loss not stated but probably was very high. Duration 2 hours (4:08 - 6:00) to control. Wind SSE at 11 m.p.h., temperature 84° F, humidity 66 percent. Spread favored by age of structures, inadequate maintenance, lack of protection, congestion, inadequately equipped, undermanned fire department. Mutual aid response from many nearby cities and towns. No common radio frequency. Brief published report by N.F.P.A. available.

SUMMARY OF MIXED URBAN-RURAL FIRES

No.	Date of Origin	Name	State	Acres	Structures
1.	8/10/40	San Marcos Fire	Calif.	4,365	19
2.	4/21/41	Marshfield Fire	Mass.	"some"	450
3.	10/20/42	Los Angeles Fires	Calif.	"many"	65
4.	11/6/43	So. Calif. Fires	Calif.	"many"	200
5.	10/23/47	Maine Fires	Maine	206,000	1,200
6.	11/4/48	Topanga Canyon Fire	Calif.	"many"	37
7.	12/26/56	Malibu Fires	Calif.	37,538	82
8.	5/6/57	Massachusetts Fires	Mass.	64,000	50
9.	10/2/58	Monrovia Fire	Calif.	14,500	28
10.	10/2/58	Pearson No. 2 Fire	Calif.	3,135	9
11.	10/21/58	Haskett Fire	Calif.	4,070	10
12.	12/2/58	Liberty Fire	Calif.	17,860	21
13.	12/15/58	Stewart Fire	Calif.	68,000	14
14.	12/31/58	Mulholland Fire	Calif.	4,982	65
15.	7/10/59	Laurel Canyon Fire	Calif.	184	37
* 16.	9/8/59	Deadwood Fire	S. D.	4,501	"several"
17.	7/20/60	Johnstone Fire	Calif.	22,146	30
18.	5/13/61	Griffith Park Fire	Calif.	800	8
19.	7/10/61	Harlow Fire	Calif.	19,200	106
20.	11/6/61	Topanga Fire	Calif.	8,715	9
21.	11/6/61	Bel Air Fire	Calif.	9,720	520
22.	11/13/61	Lovell Fire	Calif.	2,107	8
23.	4/28/62	W. Glen Falls	N. Y.	650	15
24.	7/10/62	Hawstone Fire	Pa.	"hundreds"	21
25.	8/26/52	Widow Cr. Fire	Calif.	10,800	23
26.	8/28/62	Newhall Fire	Calif.	8,788	30
27.	4/20/63	New Jersey Fires	N. J.	200,000	458
28.	4/ /63	Staten Island Fire	N. Y.	6,400	100
29.	3/16/64	Glendale-Burbank Fires	Calif.	12,119	22
30.	7/21/64	Cozy Dell Fire	Calif.	18,265	8
31.	8/23/64	Woodchuck Fire	Calif.	1,440	8
* 32.	9/19/64	Santa Rosa Fires	Calif.	71,531	295
* 33.	9/22/64	Coyote Fire	Calif.	67,000	106 +

* Indicates Fires Studied

DESCRIPTION OF MIXED URBAN-RURAL FIRES

1. August 10, 1940. San Marcos Fire, Calif.

Fire burned 4,375 acres of heavy brush and destroyed 19 residences in and near this city located in San Diego County. No record of lives lost or property damage although the latter undoubtedly was quite high. Winds were strong and gusty. Maximum temperature was 106° F and minimum relative humidity 18 percent. No record of mutual aid although this probably can be assumed. No record of duration. Five miles of telephone lines and 2 1/4 miles of power lines burned. Fire perimeter 27 miles. No record of detailed report of the fire.

2. April 21, 1941. Marshfield Fire, Mass.

Brush fire entered town destroying 450 buildings. Described as a "conflagration". Resort town near the ocean with buildings mostly of wood frame construction with wood shingle roofs. No record of deaths or injuries. Property damage $1,100,100 plus suppression costs. Duration 4 1/4 hours (1:50 - 6:00 p.m.). Spread favored by congested resort construction, wood shingle roofs, poor water supply, inadequate access streets for equipment, high wind, and dry weather. Wind 25-30 m.p.h., low humidity, drought conditions with little rain for several weeks. No mention of mutual aid although it can be assumed in a fire of this magnitude. No record of detailed report of the fire.

3. October 20, 1942. Los Angeles Fire, Calif.

Brush fire near Los Angeles destroyed 65 buildings, mostly dwellings. No record of acres burned although it is known to have been large. No record of deaths or injuries. Property damage $1,627,000 plus suppression costs. High wind and hot, dry, weather. No mention of mutual aid although it probably can be assumed. No record of duration. No record of detailed report of the fire.

4. November 6, 1943. Southern California Fires.

A series of large brush fires destroyed 200 homes in steep mountainous areas. No record of deaths or injuries. Property damage $2,000,000 plus suppression costs. Spread favored by hot, dry weather, steep terrain, and exposure of buildings by brush fires. No mention of mutual aid although it doubtless can be assumed. No record of duration. No record of detailed report of the fire.

5. October 23, 1947. Maine Forest Fires.

Fire burned approximately 230,000 acres of timber and brush and destroyed more than 1,200 dwellings and other buildings in nine major burn areas in the state. Killed: 16. Property damage $30,000,000 plus suppression costs. Duration 5 days (Oct. 21 - 25). Worst day October 23. Spread favored by dry weather conditions, wood shingle roofs, and high winds. Approximately

180,000 acres were forested. Over 90 percent of the burned area was in organized town protection units. Houses were intermixed in the forested areas. Only a few large concentrations of structures were burned. Forest fuels mostly second growth hardwood. Mutual aid response from many cities, towns and adjoining states, the Military, etc. Evacuation, protecting structures, taxing capacity of suppression forces all were involved. Several published reports of the fires available.

6. November 4, 1948. Topanga Canyon Fire, Calif.

Fire burned over "many" acres of dense brush and destroyed 37 dwellings inside the city limits of Los Angeles. No record of lives lost. Property damage $585,000 plus suppression costs. No record of duration. Spread of this incendiary fire favored by high wind and inadequate water distribution. Mutual aid from Los Angeles County and other departments. Additional weather data available. No record of detailed report of the fire.

7. December 26, 1956. Malibu Fires, Calif.

Three contiguous fires (Newton, Hume, and Sherwood) burned over 37,538 acres of dense brush and destroyed 140 structures including 35 dwellings and 105 other buildings in Los Angeles and Ventura Counties. No record of lives lost. Property damage $6,000,000

plus suppression costs. Duration 5 days (Dec. 26-30). The Newton fire started at 2:40 a.m. Dec. 26, the Hume fire started at 5:41 a.m. Dec. 27, and the Sherwood fire at 10:50 a.m. Dec. 28. Spread favored by low humidity, high wind, dry watershed, and wood shingle roofs. Control achieved when fire ran out of fuel. Maximum temperature 75° F, minimum relative humidity 5 percent, wind speed 25 m.p.h. with gusts to 50 m.p.h. December rainfall less than 15 percent of normal. Violent, erratic fire behavior, fire whirls, and extreme rates of spread were observed. Mutual aid response from Los Angeles County, Ventura County, Los Angeles City, U.S. Forest Service, California Division of Forestry, and dozens of other departments and agencies. Involved evacuation, protecting key structures, overtaxed suppression forces. Published reports by N.B.F.U., P.S.W. Forest and Range Experiment Station, and brief report by N.F.P.A. available.

8. May 6, 1957. Massachusetts Fires, Mass.

Fire burned 64,000 acres of brush and low value timber and destroyed 50 buildings including summer homes and other structures in Plymouth County. No record of lives lost. Property damage $1,500,000 plus suppression costs. This fire of unknown cause followed an extended dry period. Weather records available. No

record of mutual aid response but probably was considerable in a fire of this size. No record of duration. No record of detailed reports of the fire.

9. October 2, 1958. Monrovia Fire, Calif.

Fire burned 14,500 acres of dense brush, destroyed 28 structures, and damaged 1 other on the Angeles National Forest in Los Angeles County. No lives lost. Property damage $2,000,000 and suppression costs $500,000. Started by children with matches. Weather dry and windy. Steep, inaccessible terrain. No record of duration. No record of mutual aid involved although large response is automatic with a fire of this magnitude in this area. Weather records available. Brief published report by N.F.P.A. available.

10. October 2, 1958. Pearson No. 2 Fire, Calif.

Fire burned 3,135 acres of dense brush, destroyed 9 structures, and damaged 1 other in San Diego County. No record of lives lost or property damage. No other data at hand but probably can be obtained.

11. October 21, 1958. Haskett Fire, Calif.

Fire burned 4,070 acres of dense brush, destroyed 10 structures and damaged 11 others in Los Angeles County. No record of lives lost or property damage. No other data at hand but probably can be obtained.

12. December 2, 1958. Liberty Fire, Calif.

Fire burned 17,860 acres of dense brush, destroyed 21 structures, and damaged 8 others in the vicinity of Malibu Beach, Los Angeles County. Two fire department pumpers also were lost. No record of lives lost. Property damage $447,500 and suppression costs $90,000. Two separate fires, one starting at 10:30 p.m. and the other at 11:15 p.m., joined at 12:30 a.m. Dec. 3 to form this fire. Duration 4 days. Spread favored by strong Santa Ana winds (to 100 m.p.h.), dry fuels, lack of rain (only 0.60 inch since July), wood shingle roofs, and poor access for trucks. Extremely high rates of spread; maximum 6 miles in 7 hours. Large mutual aid response for fire and rescue. Many organizations involved. Brief published account by N.F.P.A. available.

13. December 14, 1958. Stewart Fire, Calif.

Fire burned 68,000 acres of brush, destroyed 14 structures and damaged 10 others in and adjacent to the Cleveland National Forest in Orange and San Diego Counties. Near San Juan Capistrano (where the swallows come back to). Duration of threat 24 days (Dec. 14, 1958 to Jan. 7, 1959). Worst period Dec. 15 - 23. Actually includes the main fire and several smaller contemporary fires. Killed one U.S.F.S. Ranger. The suppression cost alone

was $645,300. Property damage was $952,500. Steep, inaccessible terrain. Started by a tracer bullet. Mutual aid response for fire and rescue from all major protection agencies in the area. Taxed the mutual aid system. Extremely large areas burning at one time. Brief published report by N. F. P. A. available.

14. December 31, 1958. Mulholland Fire, Calif.

Fire destroyed 4,982 acres of dense brush and trees, destroyed 65 structures, and damaged 10 others in Los Angeles County. Steep, inaccessible terrain and adverse weather. No lives lost. Property damage $648,000 and suppression costs $82,000. No record of duration or time of origin. No record of mutual aid involved but substantial m.a. response is automatic with a fire of this type. Brief published account by N. F. P. A. available.

15. July 10, 1959. Laurel Canyon Fire, Calif.

Fire burned 184 acres of dense brush and trees and destroyed 37 dwellings in the Santa Monica Mountains in Los Angeles City and County. Conflagration spread from building to building favored by steep slopes, narrow trails, and inaccessible homes. Started in the afternoon by a smoker. No record of duration. Nine persons injured. No lives lost. Property damage $1,095,000 plus suppression cost. No record of mutual aid response but it is known to

have been large involving many departments and agencies. Brief published account by N.F.P.A. available.

16. September 8, 1959. Deadwood Fire, S. D.

Fire destroyed 4,501 acres of timber and brush, 2 wood processing plants, and several other structures in and near the city. Black Hills National Forest. The fire twice threatened the city. No lives lost. One person injured. Property damage $1,558,000 and suppression cost $300,000. Duration 7 hours (1:00 - 8:00 p.m.). Spread from structure to structure. Wind SW at 20-25 m.p.h., temperature 96° F maximum, and relative humidity 11 percent minimum. Cold front passage caused sharp change in wind direction with renewed threat to the town. Extensive mutual aid response from both public and private departments. Organization strained at peak threat. Detailed published report by National Fire Coordination Study available.

17. July 20, 1960. Johnstone Fire, Calif.

Fire burned 22,146 acres of dense brush and trees and destroyed 30 structures on the Angeles National Firest in Los Angeles County. No lives lost. Property damage $11,033,500 and suppression cost $800,000. Caused by lightning. Spread favored by steep terrain, dry condition of fuel and weather, and inaccessibility to trucks. Weather mostly sunny, hot. Temperature 96° F

and 82° F at the 1,000 ft. level and 5,000 ft. level, respectively, wind SW at 6-15 m.p.h., and relative humidity 25 -30 percent. No record of time of origin or duration. Large mutual aid response from many agencies and departments. Brief published report by the N.F.P.A. available.

18. May 13, 1961. Griffith Park Fire, Calif.

Fire burned 800 acres of dense brush and trees, destroyed 8 buildings and damaged 9 others in the Hollywood Hills section of Los Angeles. Cause unknown. One injury. No record of fatalities. Property damage $500,000 plus suppression costs. No record of time of start or duration. Spread favored by steep terrain, poor access for equipment, and adverse weather. Large mutual aid response. Brief published report by N.F.P.A. available.

19. July 10, 1961. Harlow Fire, Calif.

Fire burned 41,200 acres of timber and brush and destroyed 2 towns including 90 structures on the Sierra National Forest in Mariposa County. "Fire storm" wiped out the towns of Ahwahnee and Nipinnawasee on July 11 during a run that burned 30 square miles in 2 hours. Duration 4 days (10:20 a.m. July 10 to July 13). Caused by careless use of fire in brush burning. Lives lost: 2. Property damage $1,396,000 plus suppression costs. Wind NW at

10 m.p.h. average, temperature in the 80's, and relative humidity "low". Mutual aid response from all major agencies plus many others. Involved evacuation and protecting key structures. Tested capacity of suppression forces. Brief published accounts by N.F.P.A. and unpublished accounts by the Pacific Southwest Forest and Range Experiment Station.

20. November 6, 1961. Topanga Fire, Calif.

Fire burned 9,720 acres of brush, destroyed 9 structures, and damaged 4 others within the city limits of Los Angeles. Started during, and just a mile west of, the Bel Air Fire. No lives lost. Property damage $300,000 plus high suppression costs. Duration 3 days (1:00 p.m. Nov. 6 to Nov. 9). Incendiary cause. Spread favored by steep terrain, high wind, dry weather, dry fuels, wood shingle roofs, and poor access for equipment. Heavy mutual aid response by large numbers of agencies and departments. Los Angeles County Fire Department in charge because Los Angeles City F. D. tied up with Bel Air Fire. Mutual aid strained because two large contiguous fires going. Wind N to NE at 35 m.p.h., gusts to 50 m.p.h., humidity 5 percent minimum, temperature in 70's. Brief published report by N.F.P.A. available.

21. November 6, 1961. Bel Air Fire, Calif.

Fire burned 6,090 acres of brush and trees, destroyed 520 homes, and 24 other buildings within the city limits of Los Angeles. Homes mostly very expensive. Described as "conflagration". No lives lost. Property damage $24,000,000, suppression cost $3,000,000. Accidental origin. Duration 44 hours (8:10 a.m. Nov. 6 to 4:00 a.m. Nov. 8). Flying brands, mostly burning wood shingles and shakes set numerous fires up to 1 1/2 miles downwind from the main fire. Wind N to NE at 35 m.p.h. with gusts to 50 m.p.h., humidity 5 percent minimum, temperature in the 70's. Full mutual aid response from all agencies and departments. Forces taxed by magnitude of this fire plus an even larger fire burning nearby that siphoned off equipment and men. Radio jammed for hours, failure of water supplies, shortage of men and equipment, and much evacuation required. Detailed published reports by N.F.P.A., N.B.F.U., and Los Angeles City Fire Department available.

22. November 13, 1961. Lovell Fire, Calif.

Fire burned 2,107 acres of brush and trees and destroyed 8 houses on the Angeles National Forest in Los Angeles County. Seven persons were injured. Property damage was $675,000. Spread favored by adverse weather including strong Santa Ana winds, dry weather, dry fuel, and steep slopes. No record of time of origin

or duration. No record of mutual aid response although it can be assumed to have been large. No record of detailed report of the fire.

23. April 28, 1962. West Glen Falls Fire, N. Y.

Fire burned 650 acres of pine forest and destroyed 14 homes and 1 factory in and near this town. Fire originating in one small town spread to the forest and into a second town (W. Glen Falls). Timber was pitch pine. No lives lost. Property damage $30,000 plus suppression costs. Wind at fire SW to S at 15 - 20 m.p.h., gusts to 30 m.p.h. Fuel moisture 4.7 percent, burning index 120. There was mutual aid response although the amount is unknown. Burned during daylight hours but duration is unknown. Brief report on the fire available.

24. July 10, 1962. Hawstone Fire, Pa.

Fire burned hundreds of acres of forest and brush and destroyed 21 houses, mostly 2-story wood frame, in and near this small old mill town near Lewiston. Town 1/3 destroyed. No lives lost. Property damage $75,000 plus suppression costs. Duration 3 hours (2:00 - 5:00 p.m.). Originated in town and spread to the forest. Spread favored by prevailing drought conditions, low water level in river, dry fuel, high wind, and congested, flammable construction. Town located in narrows along river between

steep, forested mountains on either side. Only 30 to 40 foot clearance between houses and woods. Brush and hardwood trees. Flying brands set fires across river. Mutual aid involved but composition unknown. Brief report of the fire available.

25. August 26, 1962. Widow Creek Fire, Calif.

Fire burned 10,800 acres of brush and timber and destroyed 23 structures including 14 dwellings, 7 lodges, and 2 other buildings in Lake County. No record of lives lost. Property damage $523,000 plus suppression costs. Weather hot, dry, and windy. No record of time of origin or duration. Mutual aid involved but not record of amount or special problems. No record of detailed report of the fire.

26. August 28, 1962. Newhall Fire, Calif.

Fire burned 8,788 acres of brush, destroyed 30 structures including a large sanitarium (Olive View) and damaged 10 other structures on the Angeles N.F. and in Los Angeles County. No casualties. Property damage $800,000, damage to watershed $1,430,325, and suppression costs $250,000. Duration 54 hours (1200 Aug. 28 to 1800 Aug. 30). Cause home owner burning rubbish. Extreme rates of spread and erratic behavior including a "firestorm" near the sanitarium. Spread favored by strong, dry N winds and extreme

burning conditions. Evacuation of sanitarium and homes complicated by rush hour traffic and broken communications. Much successful independent action during peak threat to structures. Los Angeles County primarily responsible. Mutual aid for fire and rescue from U.S.F.S., Los Angeles City, Highway Patrol, Los Angeles Police, Civil Defense, and other city departments. Another fire burning in same area at same time. Brief report by U.S.F.S. available.

27. April 20, 1963. New Jersey Fires, N. J.

A series of fires during a 10-day period burned 200,000 acres of forest and brush and destroyed 458 structures in New Jersey Seven persons dead, 2,500 evacuated, and 1,000 left homeless. Duration 10 days (April 20 - 30). Extremely high rates of spread (to 1 1/2 m.p.h.) observed. Spread favored by prevailing drought conditions (worst on record), very dry fuels, and strong winds. Wind 20 - 40 m.p.h., temperature 80° F, and relative humidity 23 percent. Much mutual aid involved in several instances during the period. Brief published accounts by U.S.F.S. (Northeastern Station) and N.F.P.A. available.

28. April 20 - 21, 1963. Staten Island Fires, N. Y.

Fire burned 6,400 acres of brush and destroyed 100 homes near New York City. No record of casualties, property damage or suppression costs. Occurred during the same period as the New Jersey Fires of April 20 - 30. Rapid fire spread favored by prevailing drought conditions (worst on record), unseasonably high temperatures, low humidity, and dry fuels. Mutual aid involved but the composition is not known. Brief published account in Fire Control Notes (U.S.F.S.).

29. March 16, 1964. Glendale - Burbank Fires, Calif.

Three contiguous fires occurring on the same day burned 12,119 acres of brush, destroyed 22 structures, and damaged 28 others in Los Angeles County. The Whiting Woods Fire burned parts of Glendale, Burbank, and Los Angeles; the Chevy Chase Fire parts of Pasadena, and Los Angeles; and the Weldon Fire parts of Los Angeles City and L. A. County. Duration of threat 38 hours (5:47 a.m. March 16 to 8:00 p.m. March 17). Cause, power lines blown down by extremely strong Santa Ana winds with gusts to 90 mph. Spread favored by high winds, dry fuels, dry weather, low humidity, and flying brands. Five other multiple alarms were answered in this same period. Full mutual aid response. Problems of

evacuation, communications, and shortages of equipment and manpower at peak threat. No record of casualties. No record of property damage or suppression costs although both doubtless were quite high. Detailed accounts of weather by the Riverside Fire Lab and brief published account by N.F.P.A. available.

30. July 21, 1964. Cozy Dell Fire, Calif.

Fire burned 18,265 acres of brush and timber and destroyed 8 structures on the San Bernardino N. F. in San Bernardino County. Threatened the communities of Crestline, Cedar Pines Park, and adjacent resorts. No record of casualties. No record of property damage or suppression costs although both are known to have been high. Spread favored by high winds, steep, inaccessible terrain, dry fuels, dry weahter, and flying brands. Wind-borne brands carried fire across control lines including a 4-lane super-highway bisecting the fire area. Duration at least 3 days. U.S.F.S. primarily responsible for control. Mutual aid response from California Division of Forestry, Civil Defense, and local departments. Brief report by U.S.F.S. available.

31. August 23, 1964. Woodchuck Fire, Calif.

Fire burned 1,440 acres of brush, destroyed 8 structures, and damaged 1 other in Riverside County. No record of casualties. No record of property damage or suppression costs although both are known to have been high. No record of time of origin or duration. Mutual aid response. California Division of Forestry the responsible agency. Brief report by C. D. F. available.

32. September 19, 1964. Santa Rosa Fires, Calif.

Three adjacent fires burned 71,531 acres of heavy timber and brush, destroyed 295 structures, and damaged many others in and adjacent to 4 cities in Napa and Sonoma Counties. The Hanley Fire threatened the cities of Calistoga and Santa Rosa, the Nuns Canyon Fire threatened Boyes Hot Springs, and the Mt. George Fire threatened Napa. No fatalities or serious injuries. Property damage "in the millions" plus watershed damages. Suppression costs $787,000 just to the State. Duration 8 days (7:00 a.m. Sept. 19 to 7:00 a.m. Sept. 27). Spread favored by extremely high winds, large quantities of dry fuel, dry, hot weather, and lack of equipment and manpower. Winds N at 35 - 40 m.p.h. with gusts over 50 m.p.h., temperature 100° F, and relative humidity 4 - 10 percent. Heavy mutual aid response from Civil Defense, other departments, sheriff, highway patrol, and Military. Problems of

protecting structures, evacuation, and shortages of equipment. Detailed report by National Fire Coordination Study and Calif. Div. Forestry available.

33. September 22, 1964. Coyote Fire, Calif.

Fire burned 67,000 acres of heavy brush and trees and destroyed more than 106 homes in and near the city of Santa Barbara in Santa Barbara County and on the Los Padres N. F. Lives lost: 2. Property damage $2,788,400, plus an estimated $1,500,000 for value of contents. Suppression cost $2,500,000 (est.). Fire driven by strong Santa Ana winds entered the city of Santa Barbara in several places destroying several groups of expensive homes and individual dwellings. Control action complicated by shifting winds, flamming brands, dry fuel, narrow, inadequate access roads for equipment, and shortages of men and equipment at critical times. Wind E and N 40 - 50 m.p.h. (Santa Ana type), temperature 100° F, and relative humidity 10 - 15 percent. Full mutual aid response from all over the State including U.S.F.S., C.D.O., C.D.F., and many independent departments. Problems of evacuation, back-firing in urban areas, protecting key structures, and independent action at peak threat. Detailed reports from the Los Padres N.F. and Pacific Southwest Station (weather and fire behavior) available.